# NGST
# Scientist's Expert Assistant (SEA)

Phase I Review

November 3, 1997

# Agenda

- Review of Initial SEA Phase I Objectives
  - Objectives/Status
  - Process Used in Phase I
  - Manually Intensive Tasks Targeted for Improvement
- NGST SEA Components
- Development Methodology and Tool Recommendations
- Phase II (FY '98) Plans
  - Goals
  - Timeline

# SEA Prototype Phases

- Phase I (end of FY97):
  - Identify target instrument for prototype work
  - Understand and describe interaction between GO (General Observer) and CS (Contact Scientist) and PC (Program Coordinator)
  - Recommend AI paradigm, tools, and methodology
  - Develop prototype user interface
- Phase II (FY 98): prototype "proof-of-concept" tools
  - Initial tool development, using HST's Advanced Camera for Surveys (ACS) as test bed
- Phase III (FY 99): expand into a live test-bed
  - Develop a full operational SEA to support HST's ACS, compare to existing HST tools
- Phase IV (FY 00): final wrap up and analysis
  - Metrics and evaluation to see if desired gains achieved

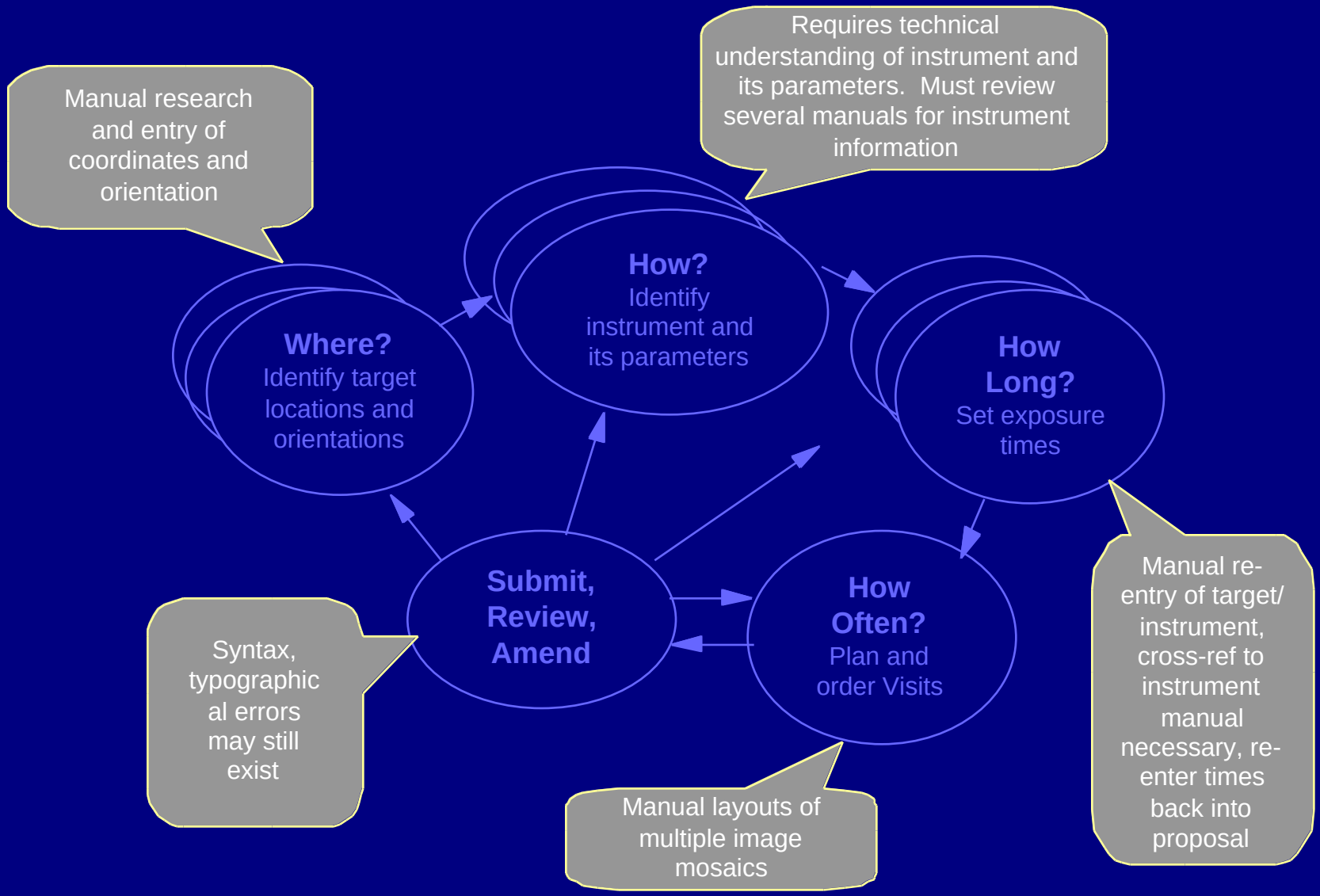
# Prototype Objectives for FY97 Q4

- Identify target instrument for prototype work - Status: HST's Advanced Camera for Surveys
- Develop script to describe interaction between GO and CS - Status: high level understanding is done, more detailed script underway to outline subset of ACS operations for prototyping
- Use script and GO/CS interviews to recommend AI paradigm, tools, and methodology - Status: combination of rules-based ES tools and visual/graphical interface tools recommended. ES Tool recommendation is complete, final decision in November
- Develop simple web-based prototype user interface to implement target script - Status: using interactive exposure time calculator as on-line "RAD" user-interface testbed, have preliminary conceptual interfaces for visual tuner and overall proposal manager

# Process and Techniques Used

- Weekly interview with ST ScI staff
- Develop high level process description/script
- Develop initial script for instrument ES development
- Review needed software tools
- Establish objectives for FY 98

# Current HST Process



# Targeted Modules for Prototype

- Graphical, "real-time" exposure calculator
  - Provide interactive real-time graphical tool for evaluating and choosing exposure times
- "Visual" target tuner
  - Provide graphical approach to fine tuning target coordinates and orientation
- Instrument configuration expert system
  - Rule based system to guide user through determining instrument parameters
- Visit planner expert system
  - Provide assistant for managing multiple exposure projects
- Re-validation assistant
  - "Agent" to automatically scan for impacts of configuration changes

# Graphical, "Real-time" Exposure Calculator

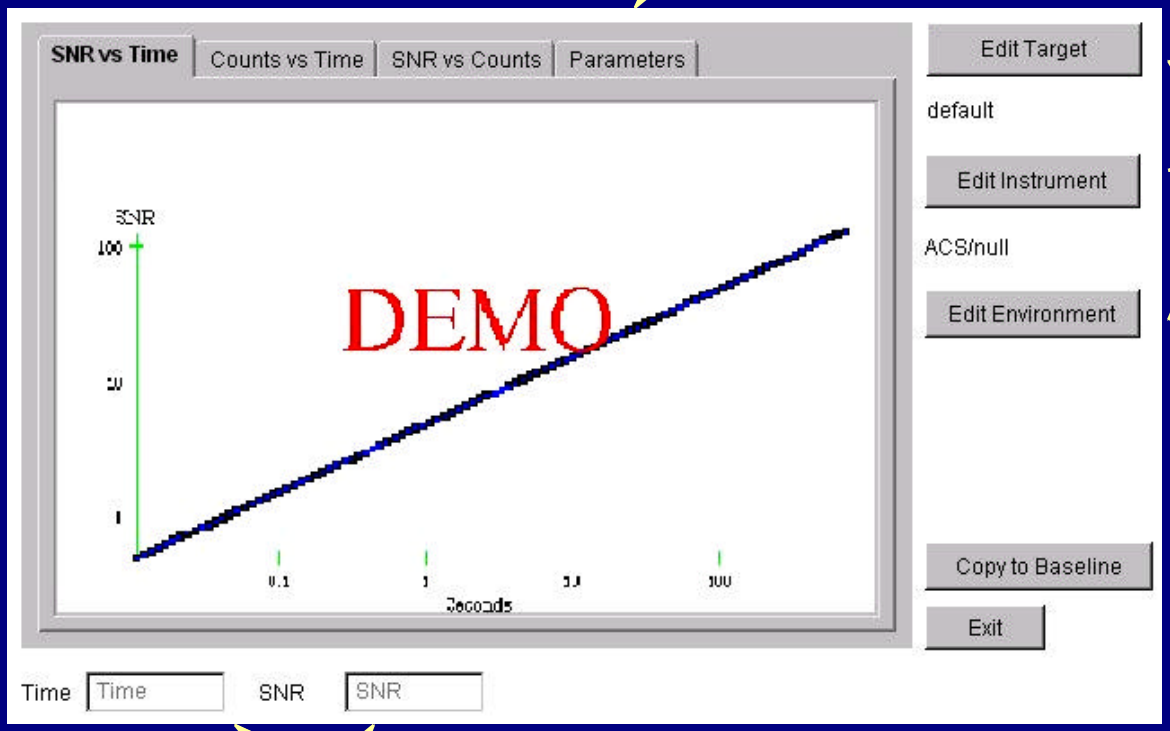
- Initial prototype tool
- Reduce volumes of pages of graphs and tables into single interactive screen
- Allow user to change target or instrument parameters and instantly see affects on source counts, signal-noise ratio, and /or exposure times
- Initial prototype will server as testbed for overall Java interface guidelines
- Targeting initial release end of December using ACS as testbed

# ACS Exposure Calculator Interface

## Initial Screen

3 charts show range of SNR/Time/Counts

Edit chart parameters




Click here to change exposure parameters, charts amended immediately

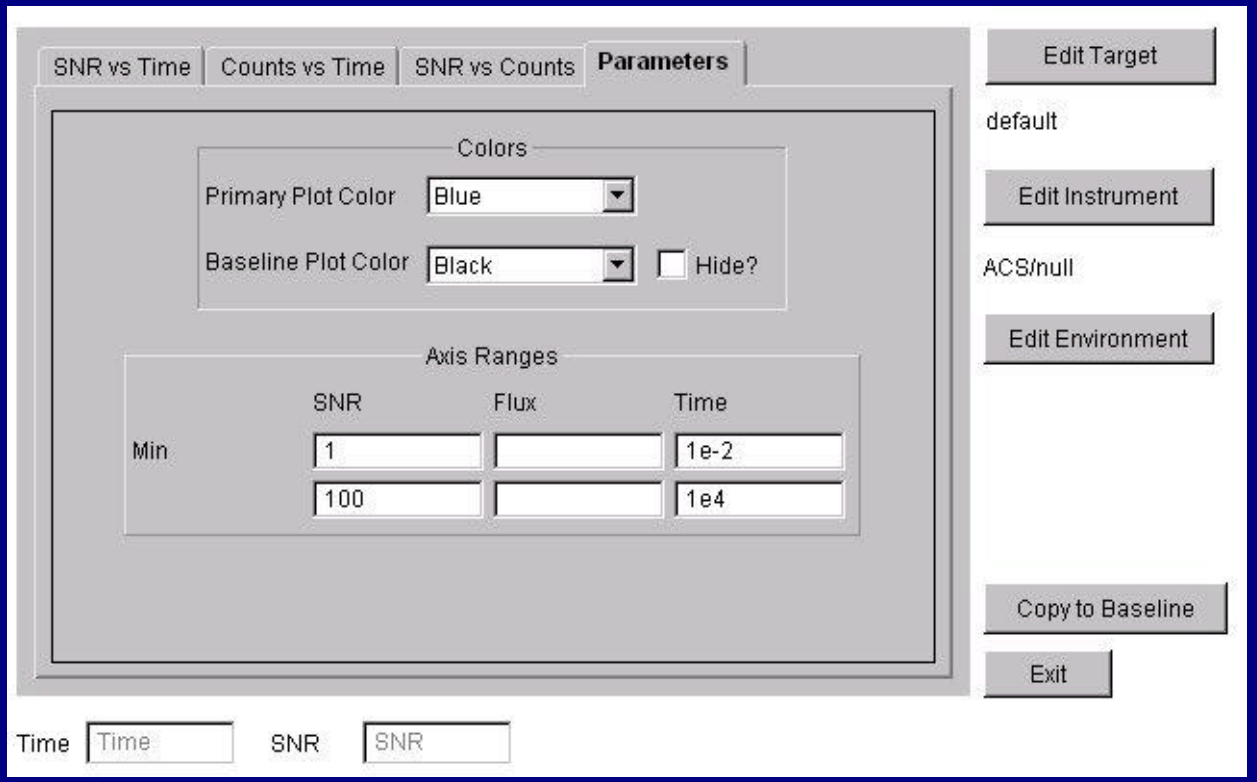
Click here to copy current parameters to a separate baseline on charts

User can click on point in chart, Time/SNR/Counts for point will appear in these fields

# ACS Exposure Calculator Interface

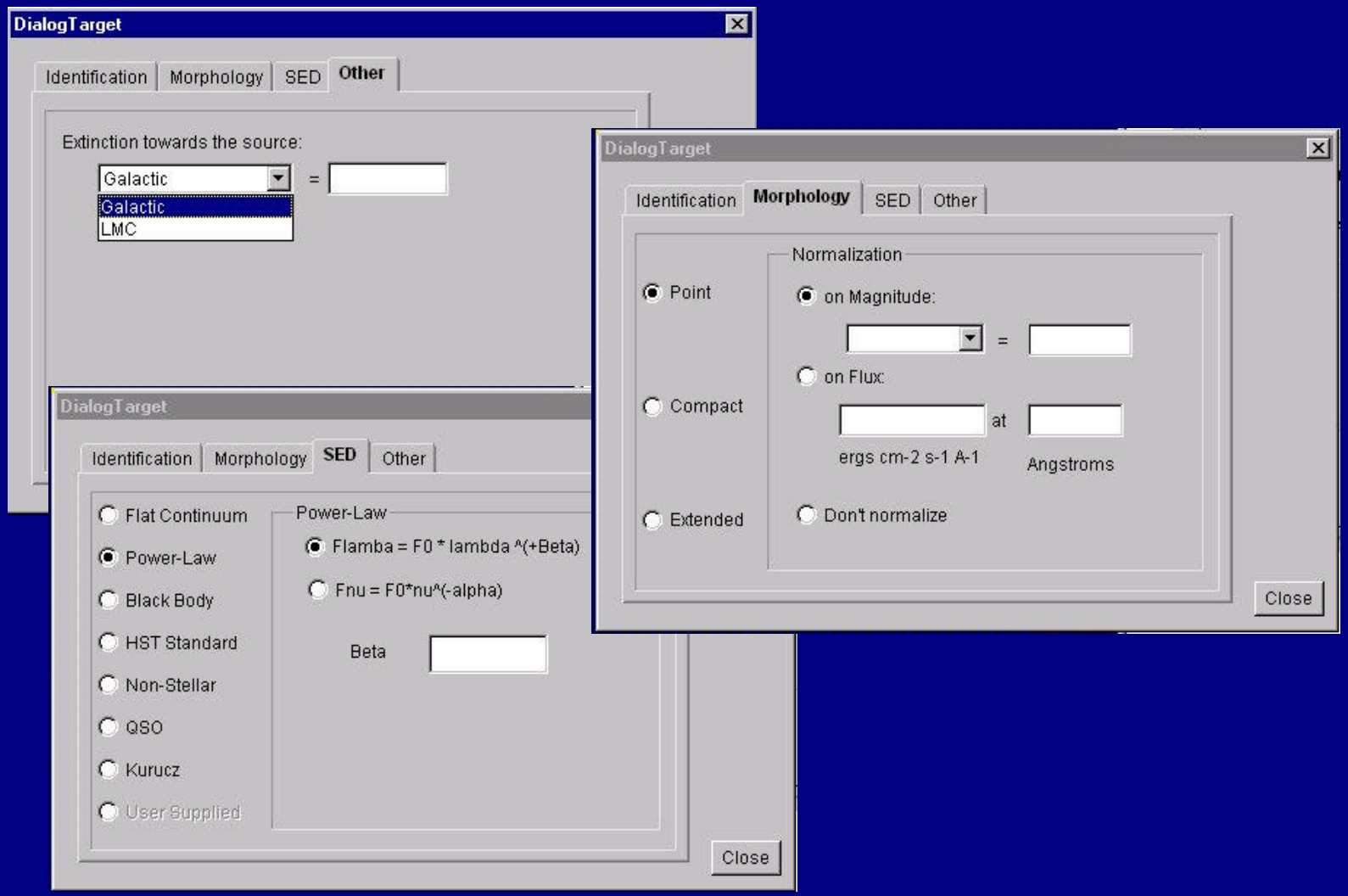
## Parameters Tab

Can set line colors, hide baseline plot, set axis ranges (can also "zoom" on any chart to change axis ranges



# ACS Exposure Calculator Interface

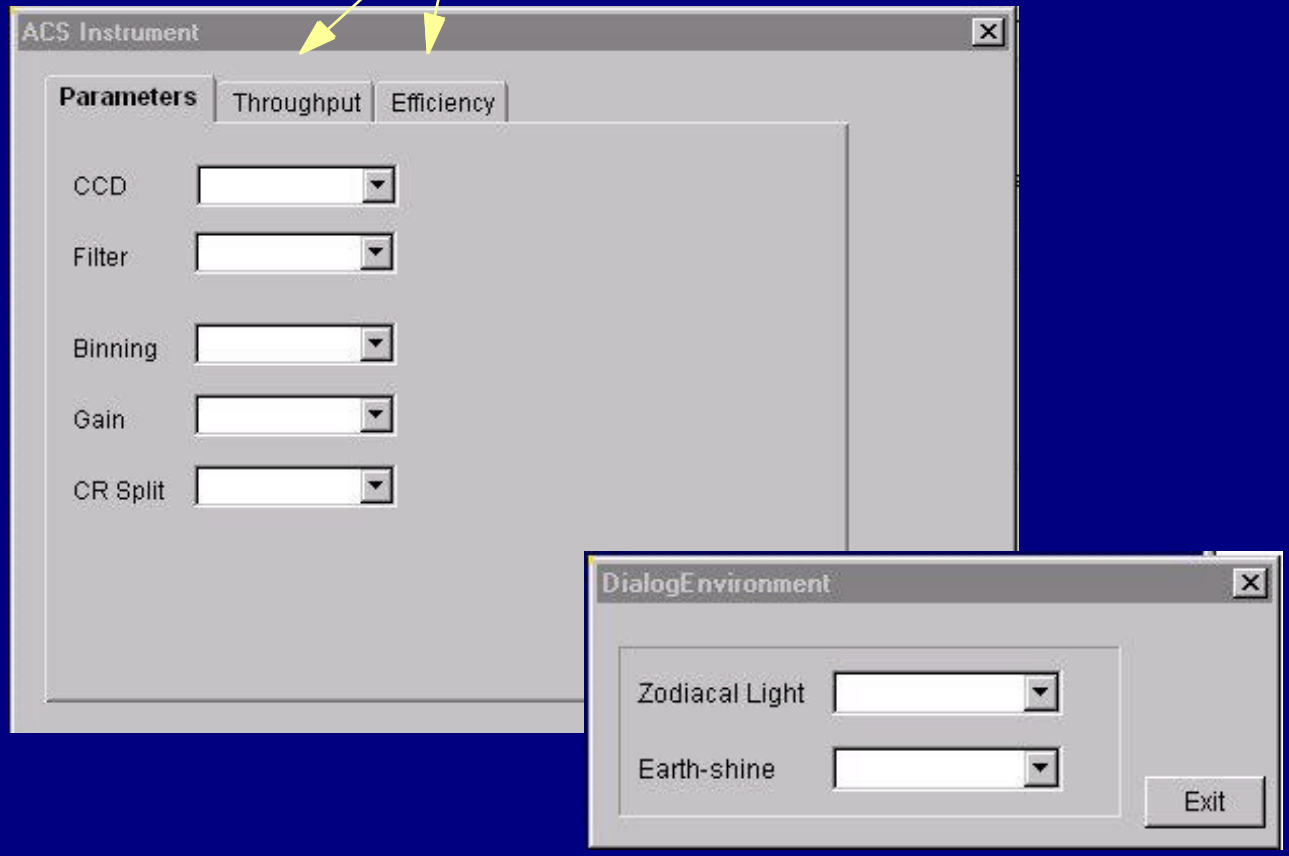
## Target Window



# ACS Exposure Calculator Interface

## Instrument and Environment Windows

Will contain plots showing CCD/Filter characteristics.



# "Visual" Target Tuner (VTT)

- Graphical approach to fine tuning target coordinates and orientation
- Allow user to mark areas specifically for inclusion or exclusion
- Simulate direction of "spikes" and spectroscopic "bars"
- Allow user to visually specify orientation ranges

# Visual Target Tuner Interface (preliminary)

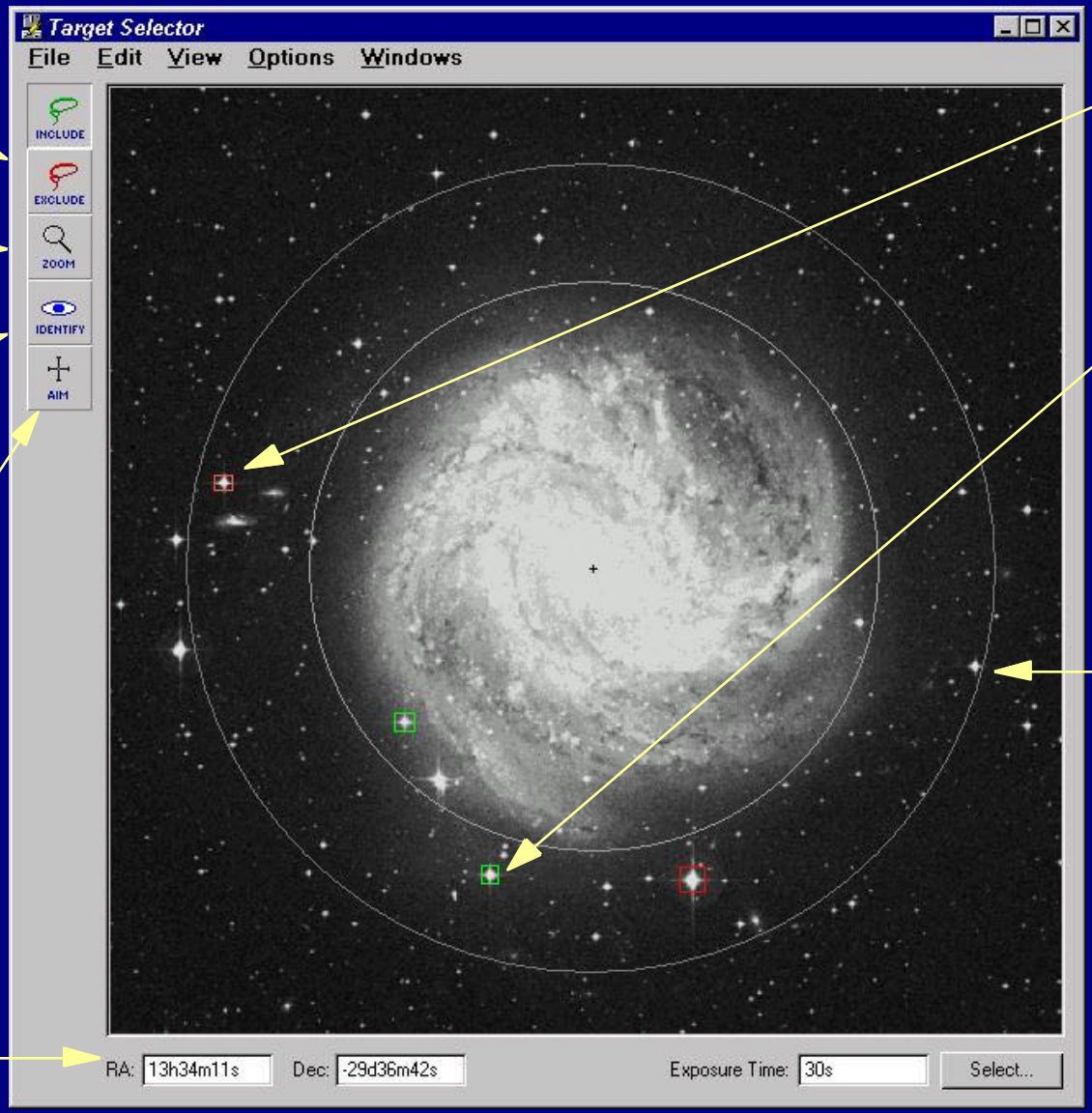
Include/Exclude objects or regions

Zoom visible region

View detailed description of any object

Aim the instrument by selecting or dragging circles

Pointing to these coordinates




Red means something that must be excluded

Green means something that must be included

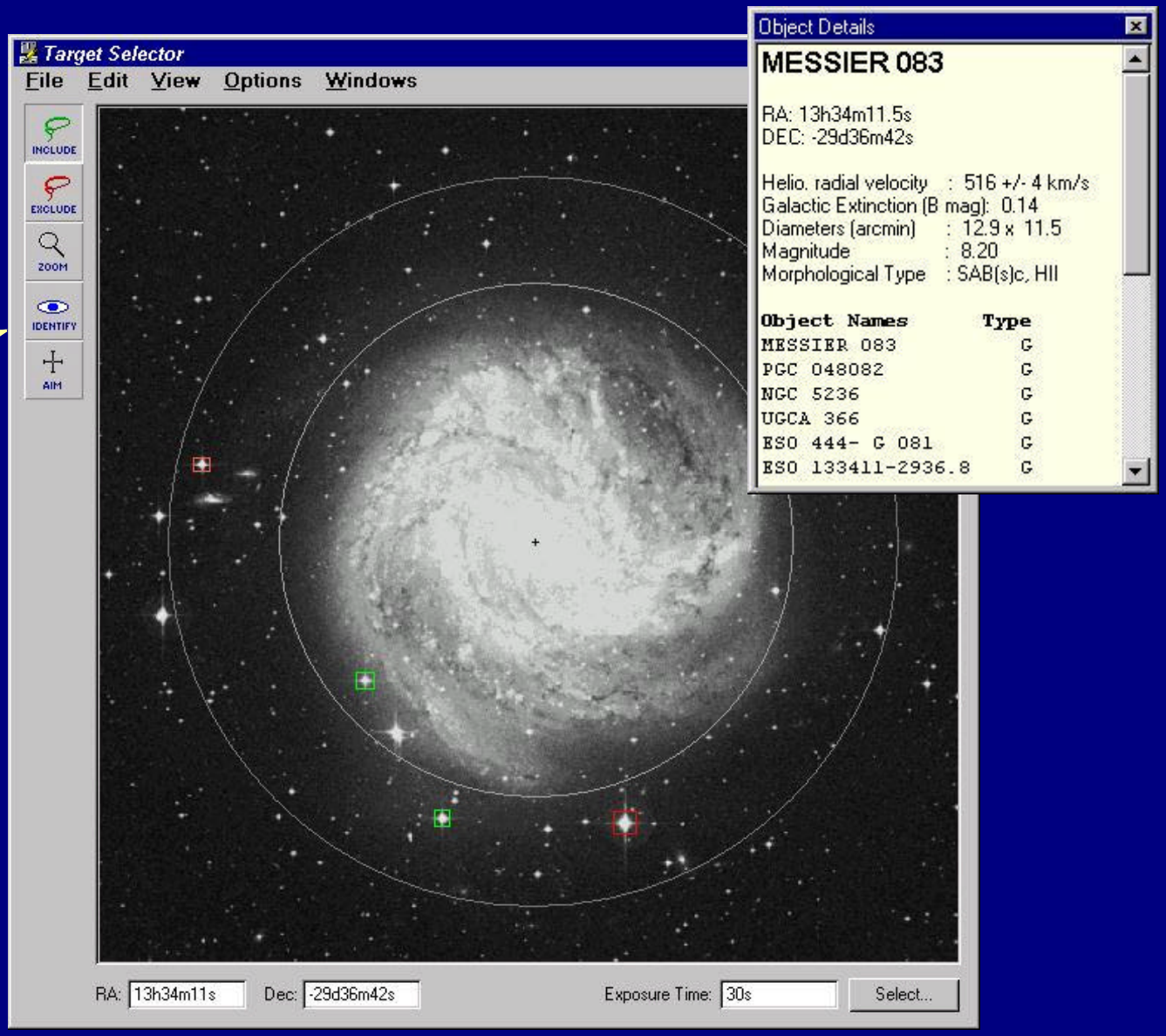
Inner circle is guaranteed area for all orientations. Outer circle is possible area.

Valid orientations might be shown by colorizing regions red that are excluded

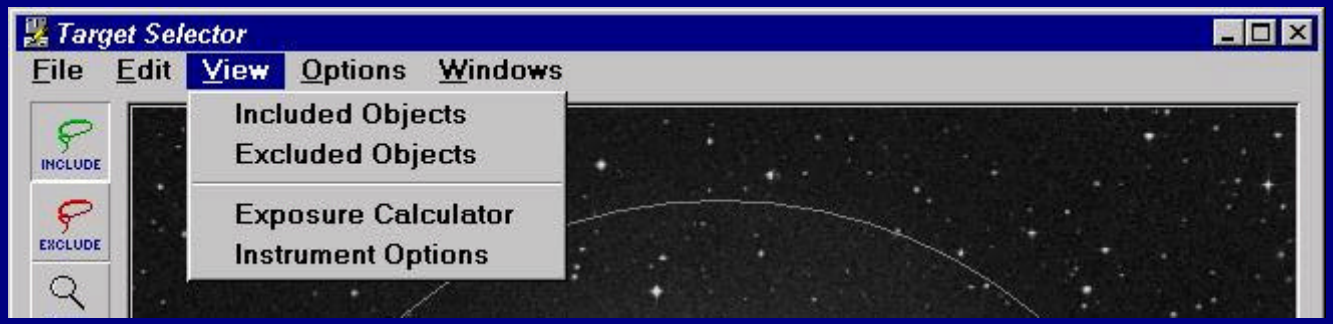
# Visual Target Tuner Interface (preliminary)

Details window would open when user chooses to identify an object. It would retrieve data from the NED database.

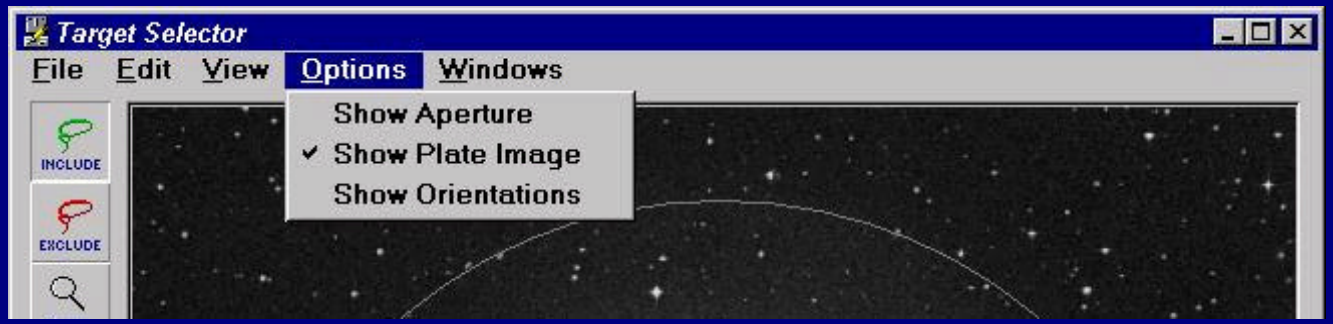
Choosing Identify, then selecting object or region, would open Details window.



# Visual Target Tuner (preliminary)




View menu allows user to see details about included/excluded objects, and to access other modules in the system.

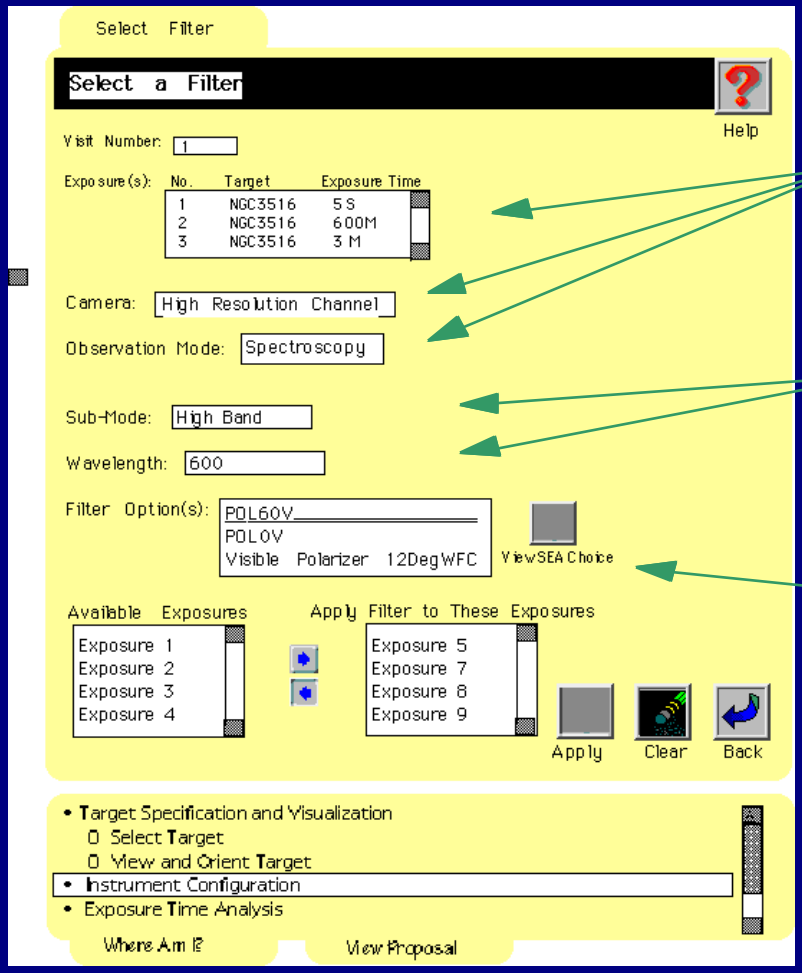



Options menu allows user to toggle plate image and sky model, show possible orientations, and show aperture.

# Instrument Configuration Expert System (ICES)

- Rule based system to guide user via science-based questions to recommendations on filters and other instrument parameters
- Integrate context-sensitive cross-references to online manuals
- Initial prototype will focus on user interface, rule base will be very small
- Subsequent prototypes will expand rule base
- Target is to handle ACS instrument parameters completely

# ICES/ACS - Preliminary Interface Sketch

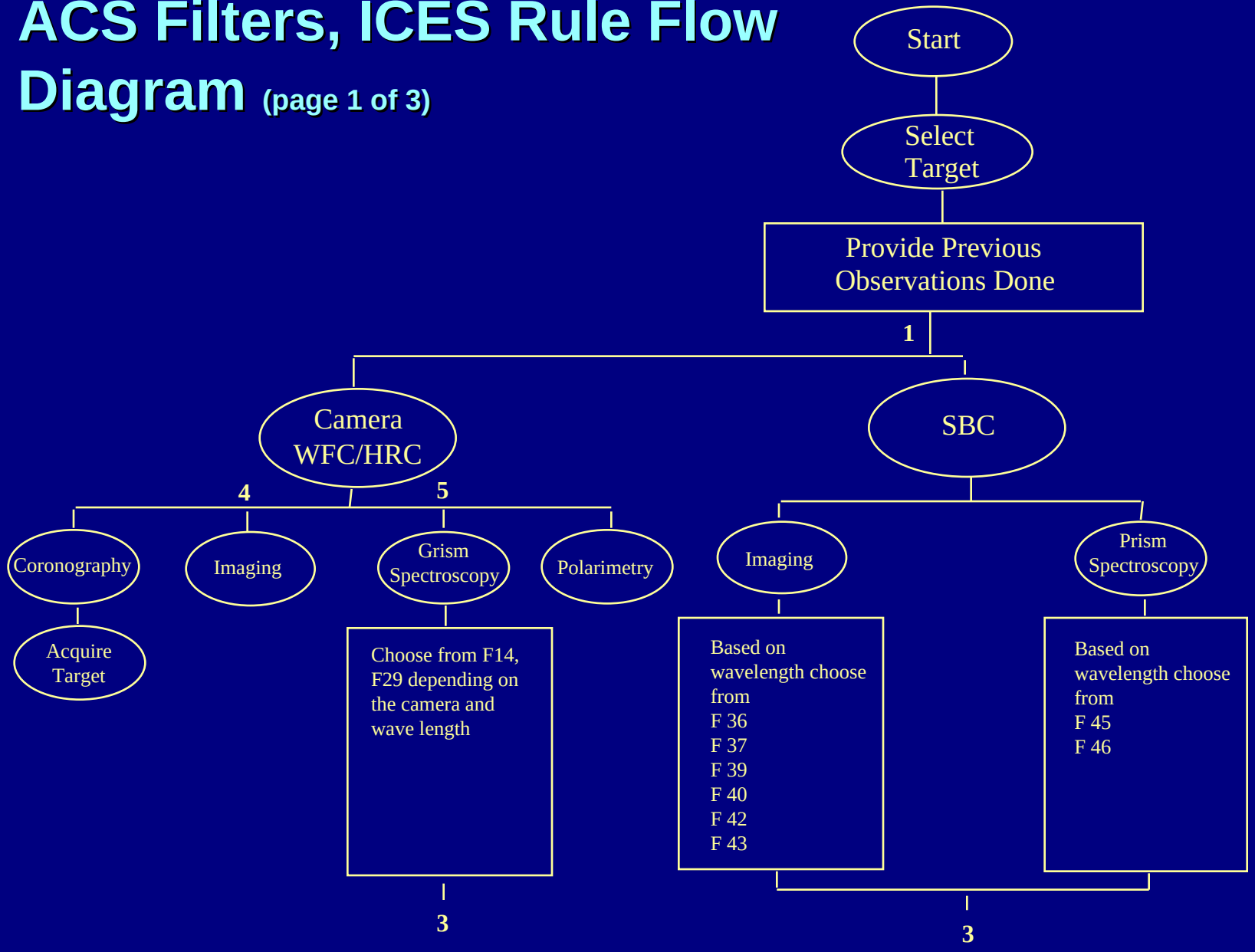



User completes this information

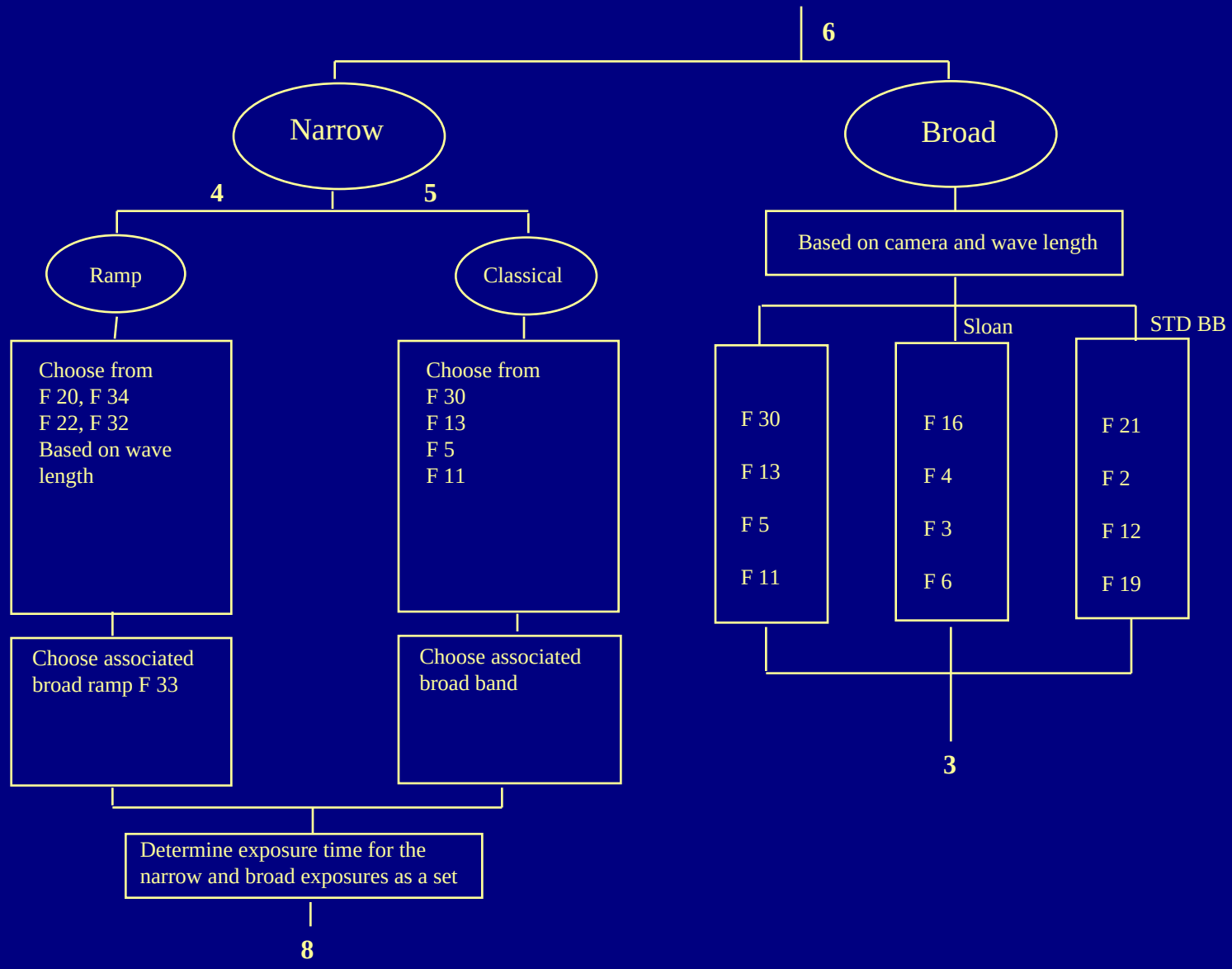
If need, will be asked for this information

SEA provides recommended filter at top, other valid filters at bottom

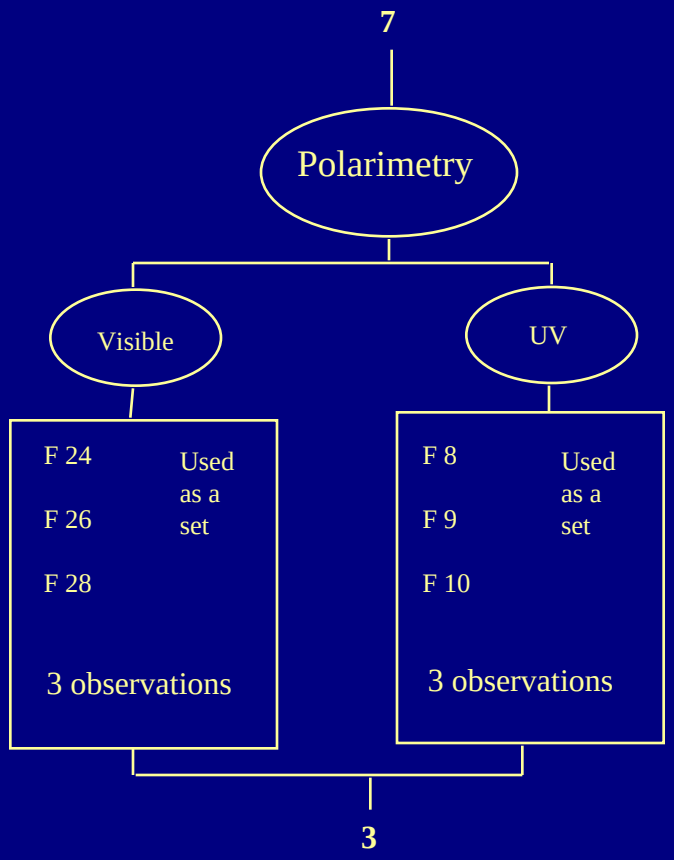
# ACS Filters, ICES Rule Flow Diagram (page 1 of 3)

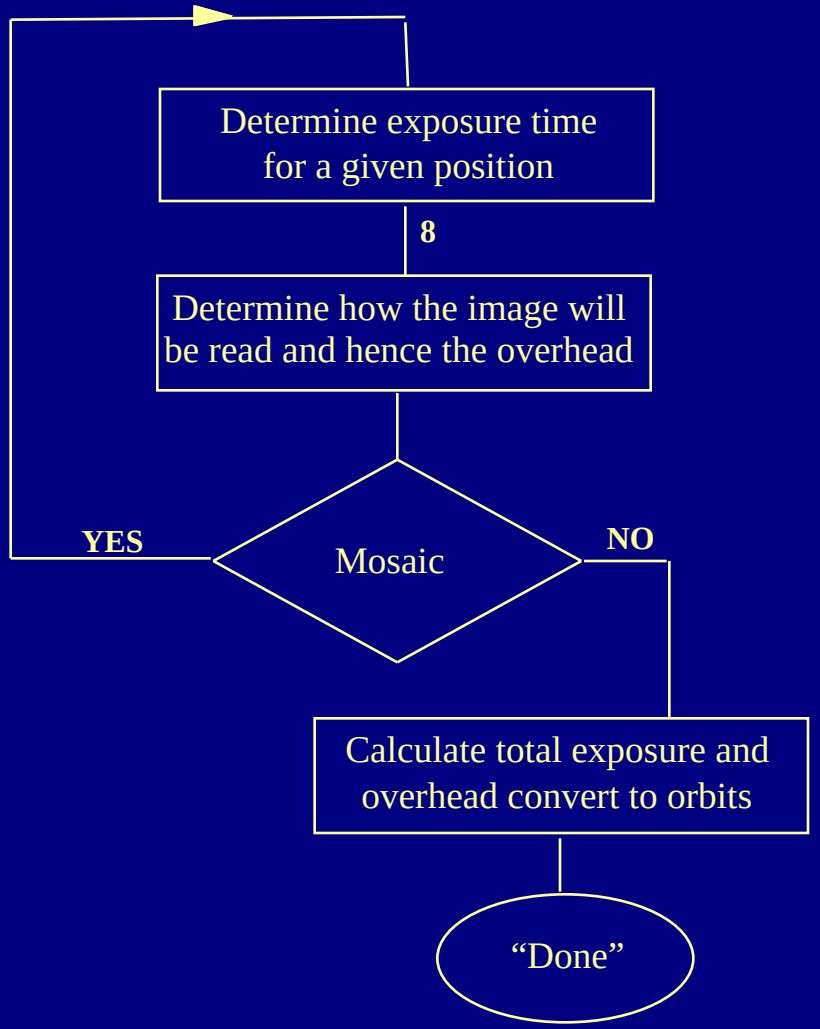


# ACS Filters, ICES Rule Flow Diagram (page 2 of 3)



# ACS Filters, ICES Rule Flow Diagram (page 3 of 3)



# Visit Planner Expert System (VPES)

- Provide guidance for ordering of multiple exposures
- Assist laying out exposures for region requiring several images as a mosaic
- Provide database query / data mining assistant to help search for multiple targets
- Automatically retrieve information about the selected targets into objects integrated with other modules

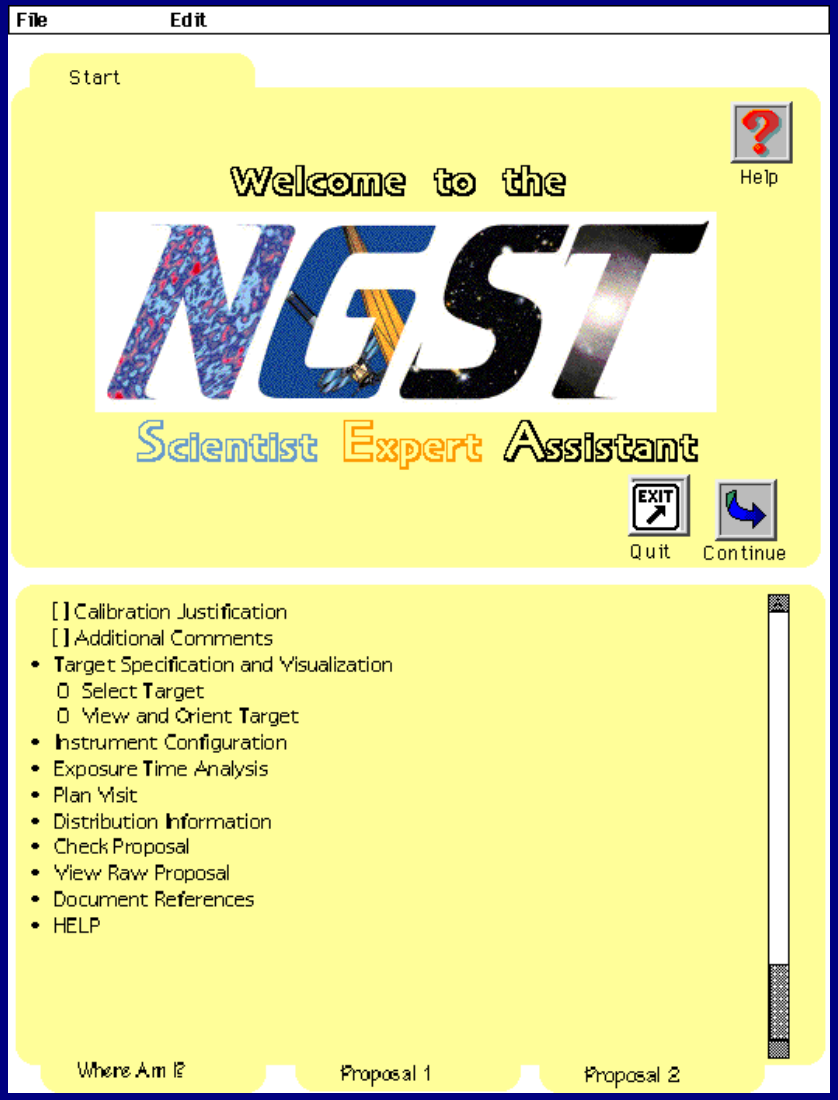
# Re-validation Assistant

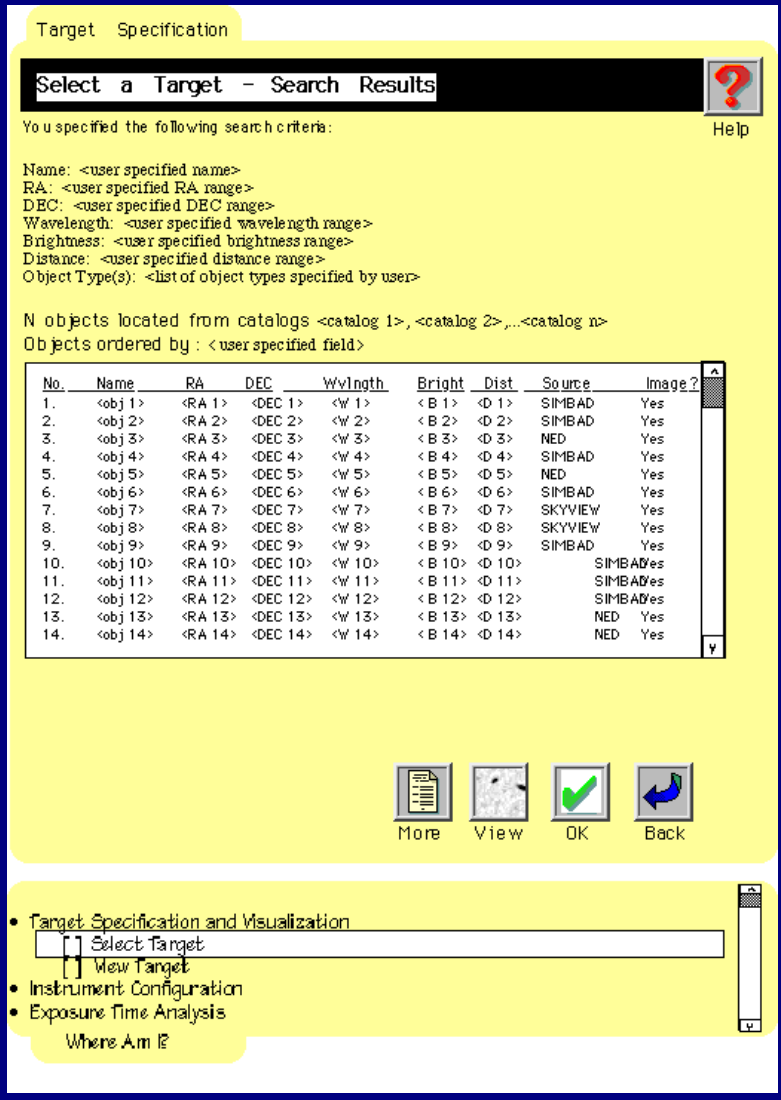
- Longer term (FY 00), “agent” to proactively look for possible problems to accepted or in-process proposals caused be “central” changes such as instrument calibration changes

# Integrated Proposal Manager

- Covering web-based interface to integrate the various modules together
- will support:
  - hierarchical organization of proposal components into folders and sub-folders
  - “drag and drop” visual management of components (targets, instrument, exposures)
  - integrated, context-sensitive links with documentation

# Proposal Manager - Preliminary Interface Sketches



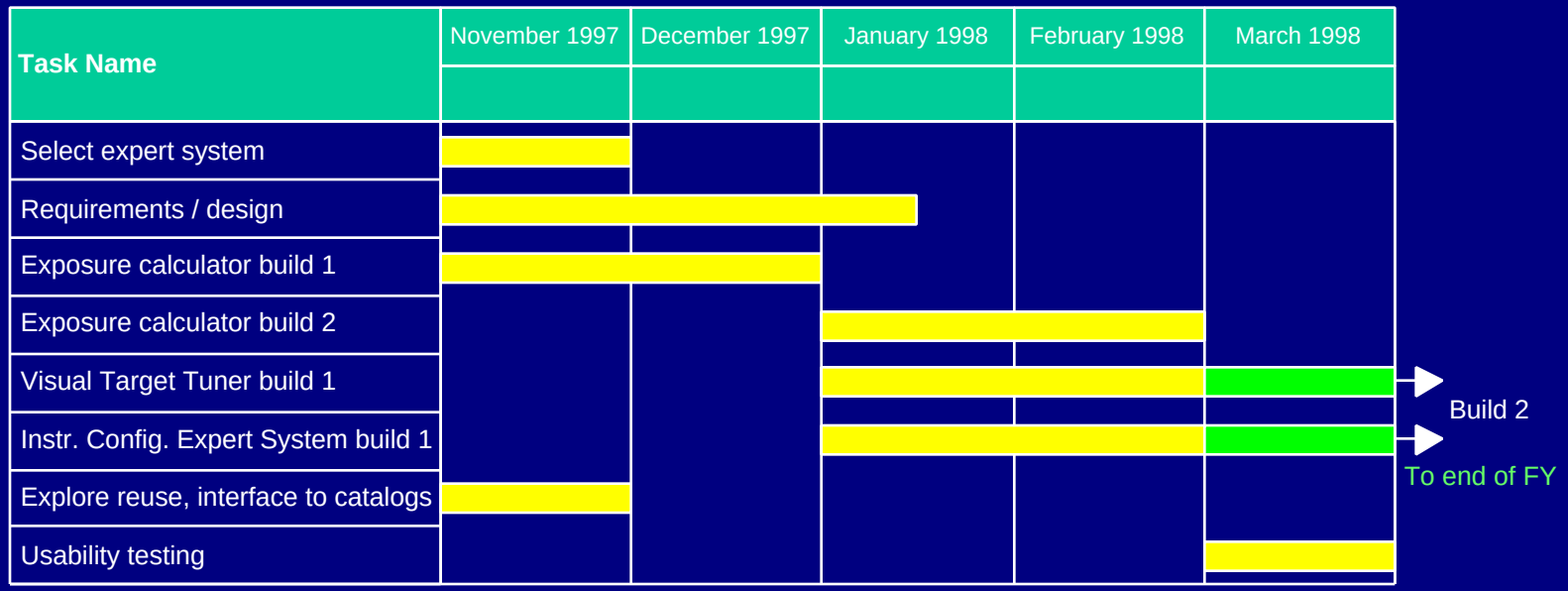
# Prototype Tool and Methodology Recommendations

- Applications development platforms:
  - Java 1.1 with either Visual Café or JBuilder as the development environment
- Expert system tools:
  - Evaluated 4 packages: - Jess, ILog, Elements Advisor, and ART* Enterprise
  - Art*Enterprise best overall ES system, but web interface and high price are concerns
  - Jess is a strong possibility for early prototype work
- Methodology:
  - Object-Oriented (using UML for design methodology)
  - Rules-based methodology recommended over Case-Based Reasoning

# Phase II (FY 98): Begin Proof of Concept

- Architecture and Design
  - Operations Concept document
  - Requirements
  - Object Design
  - Implementation plan
- Develop Interfaces with existing technology
  - Interfaces to catalogs (NED, SIMBAD)
  - Reuse of existing software (Gemini, Harvard, FITS viewers)
- Expert System
  - Solidify expert system choice
  - Training
- Initial exposure calculator in December, 1997
- Build 1 of VTT and ICES by March, 1998, Build 2 end of September, 1998

# FY 98 Timeline



# FY 98 Deliverables

- Requirements Document

  *(Includes Release Plan)*
- Design Document
- Plan for Testing and Analysis
- Exposure Calculator Prototype Release 1
- NGST SEA Prototype Release 1
- Usability Analysis Reports

# Defining Phase II / III Success Criteria

- Define measurable goals for determining effectiveness of SEA
- Establish & monitor baseline measurements for current Phase II process
  - Use existing ST ScI metrics where feasible
- Refine target improvement rates
  - Improvements rates contained in following slides are a first cut

# Preliminary Success Criteria (ST ScI)

- Halve the number of submitted proposals requiring corrections by PCs and CSs as a result of syntactical errors
- Halve the number of calls made to CSs by GOs requesting assistance with target selection
- Halve the number of calls made to CSs by GOs requesting assistance with target orientation
- Reduce total support hours ( CS/PC) support per proposal by 60%

# Preliminary Success Criteria (GO)

- Reduce GO's proposal cycle time (from initial creation to final acceptance) by 30%
- Reduce amount of GO's time consulting instrument handbooks/documentation by 50%
- Reduce amount of time learning instrument-specific on-line tools (such as exposure calculators) by 30%
- Reduce total GO hours per proposal (from initial creation to final acceptance) by 30%

# Preliminary Success Criteria (Overall)

- All users report high satisfaction level with overall SEA prototype
  - Measuring both features and performance
- All users report a high level of satisfaction with such SEA usability issues as:
  - Ease of learning tool/accessing help/locating examples
  - Ease in acquiring and installing tool
  - Ease in acquiring and installing updates